Docket No.: FRANK
Appl. No.: 10/540,281

AMENDMENTS TO THE SPECIFICATION WITH MARKINGS TO SHOW CHANGES MADE

Before the title, delete "Description".

Change the title to read --ELECTRIC MACHINE WITH A WRAPPED WINDING COOLED TO A LOW TEMPERATURE --.

Before paragraph **[0001]**, add the heading --BACKGROUND OF THE INVENTION--.

Amend the following paragraphs:

[0001] -- The invention relates to an electric machine with a rotor which can rotate about a rotation axis and has a winding to be cooled to a low temperature, in particular a superconducting winding, which is surrounded by a securing means with a ~~tape-binding~~ wrap. A rotor for a corresponding machine is disclosed in DE 199 43 783 A1.--.

[0006] -- Advantageously, corresponding HTS rotor windings are produced by first prefabricating and then testing the coils. These coils or coil packets can be combined into larger units and subsequently mounted on the poles of the supporting rotor body. During operation, the coils are subjected to considerable centrifugal forces caused by the rotation as well as to magnetic forces. These forces attempt to pull the coils toward the outside. Because a movement of the winding and in particular of the superconducting material is undesirable, the coils have to be properly secured. ~~According to the aforementioned U.S. patent application, a~~ A suitable securing means can be a tubular sheath or a ~~tape-binding~~ wrap made from glass fiber-reinforced plastic material. However, with large forces, the strength and stiffness of the fiber-reinforced plastic material is generally insufficient, so that typically tubular sheaths (see U.S. 4 060 743 A). Alternatively, segmented tubular sheaths or rings (see DE 32 12 416 A1) made of metal are used as securing means, because the elastic modulus of metals is typically 5 to

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10 times greater than those of fiber-reinforced plastic. For example, one disclosed metal jacket is formed by winding around the coil support a steel tape analogous to a fiber tape (see WO 00/49703 A). Because a metal tape, unlike a fiber tape, has a high transverse stiffness already during the winding process, such metal ~~tape-binding~~ wrap is difficult to manufacture.--

Before paragraph **[0007]**, add the heading --SUMMARY OF THE INVENTION--.

Amend the following paragraphs:

[0008] -- This object is solved for a machine with the aforedescribed features by the invention in that

- the securing means has, as viewed in the axial direction, a ~~tape-binding~~ wrap with an outside contour that widens from a smaller outside diameter to a greater outside diameter, when viewed in the axial direction, and
- the ~~tape-binding~~ wrap is surrounded by several sequentially arranged ~~friction-locked~~ force-fitting securing rings with an inside diameter which is adapted to the corresponding outside diameter of the outside contour.--.

[0009] ~~However~~ Thus, in the embodiment of the machine according to the invention, the required total stiffness of the securing means is not provided by a single component. Instead, a fiber-reinforced plastic ~~tape-binding~~ wrap is applied around the winding (= the totality of all the winding coils), for example on the pole core with the individual coils. The outside contour of the ~~tape-binding~~ wrap has an at least approximately conical shape at least in the region of the winding, whereby the precision of the cone does not have to be very high. The securing or support rings which are additionally applied to the cone for mechanical reinforcement, are not implemented as a whole cylinder, but instead as separate ring-shaped elements with different inside diameters adapted to their corresponding installation location. These diameters need not be precisely maintained; the rings should only have a diameter suitable for enabling contact on the different locations on the

cone. Is also not necessary that the securing or support rings are mounted flush next to each other; instead, they can be spaced in the axial direction, similar to the metal bands around a wooden keg. The exact spacing depends on the required axial stiffness of the winding and the maximally allowable expansion between the individual rings. The material and the cross-section of the rings are selected in consideration of the required support function.--.

[0012] --Advantageously, the ~~tape-binding~~ wrap is produced, preferably wound, from a fiber-reinforced plastic band. Advantageously, the ~~tape-binding~~ wrap can be further strengthened by using a hardenable plastic material to ensure a rigid tubular form of the ~~tape-binding~~ wrap.--.

[0014] -- The outside contour of the ~~tape-binding~~ wrap can also have the shape of a double cone with an outside diameter that is tapered towards the corresponding sides of the rotor. The respective additional support or securing rings are then installed on the ~~tape-binding~~ wrap from the two ends.--.

Before paragraph **[0016]**, add the heading --BRIEF DESCRIPTION OF THE DRAWING--.

Amend the following paragraph(s):

[0019] -- Fig. 3 a particular ~~tape-binding~~ wrap of a securing means.--.

Before paragraph **[0020]**, add the heading --DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS--.

Amend the following paragraphs:

[0025] -- According to the invention, the winding 10 inserted in the slots in the winding support 9 is secured by special securing means 12 on the support 9 against movement when subjected to a force. For this purpose, a tubular, fiber-

reinforced plastic ~~tape-binding~~ wrap 13 is conventionally applied on the support that carries the winding. The ~~tape-binding~~ wrap can optionally include a hardenable plastic for added stiffness. The outside contour of the ~~tape-binding~~ wrap should assume an at least approximately conically taper already during application or later, for example by finish- machining, so that it widens, as viewed in the axial direction, from a smaller outside diameter D_1 to a greater outside diameter D_2. The widening in the axial direction can be continuous or stepped. In this way, additional supporting or securing rings 14_l can be pushed over the ~~tape binding~~ wrap 13 from the side of the smaller outside diameter D_1 when the rotor is installed. The inside the diameter of the individual rings is adapted to the outside diameter of the ~~tape-binding~~ wrap at the location, where the corresponding securing ring is located after installation, to produce a ~~friction-lock~~ forced engagement between the ring and the ~~tape-binding~~ wrap. Optionally, these rings can at their respective location also produce a radial force that pretensions the ~~tape-binding~~ wrap. The securing rings need not be placed flush next to each other, as indicated in the Figure, but can also be spaced apart, depending on the required stiffness.--.

[0026] -- Fig. 2 shows an enlarged view of the ~~tape-binding~~ wrap 13 with three exemplary supporting rings 14_1 to 14_3 out of a larger number of rings 14_l. The conicality of the ~~tape-binding~~ wrap is exaggerated for emphasis. The rings are made, in particular, of a non-magnetic metal, such as stainless steel, or of a plastic fiber composite. There cross-sectional shape need not necessarily be square, as illustrated, but can also be rectangular, with the rings then formed as tube segments or hoops. Suitable are also round cross-sectional shapes, which make it easier to push the rings over the ~~tape-binding~~ wrap.--.

[0027] -- In the preceding exemplary embodiment, it was assumed that the conicality of the outside contour of the ~~tape-binding~~ wrap is obtained by machining or by removing material from the outside of the ~~tape-binding~~ wrap. It is, of course,

also possible to give the outside of the support body with the installed winding a conical shape and to then apply to the outside a ~~tape-binding~~ wrap that has a constant thickness in the axial direction.--.

[0028] -- Of course, the outside contour of the securing means can also be shaped as a double cone. I.e., the outside diameter of the securing means would initially widen to a greater diameter in the axial direction from one side of the rotor towards the center of the rotor, and then narrow again toward the other side of the rotor. In this case, the securing rings would have to be applied from both sides of the rotor. A corresponding exemplary embodiment of a ~~tape-binding~~ wrap, to which securing rings have not yet been applied, is shown in Fig. 3. The ~~tape binding~~ wrap having the reference numeral 15 widens from one side (diameter D_1) toward the center (diameter D_2) and then tapers toward the other side (diameter D_1'). The diameters D_1 and D_1' at the two sides need not be identical. --.

Page 12, after the heading "CLAIMS" and before the first claim add --What is claimed is:--.

Replace the Abstract with the Abstract submitted herewith on a separate sheet.